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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/694,146 | 10/27/2003 | Bennett A. Joiner | SC12810TK | 3275 |
| 23125 | 7590 | 12/02/2004 | EXAMINER | |
| FREESCALE SEMICONDUCTOR, INC. LAW DEPARTMENT 7700 WEST PARMER LANE MD:TX32/PL02 AUSTIN, TX 78729 | | | IM, JUNGHWA M | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2811 | |

DATE MAILED: 12/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/694,146 | JOINER ET AL. | |
| | Examiner | Art Unit | |
| | Junghwa M. Im | 2811 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 10 September 2004.
 2a) This action is FINAL. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-21 is/are pending in the application.
 4a) Of the above claim(s) 21 is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1-20 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of claims 1-20 in the reply filed on September 10, 2004 is acknowledged.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 16 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 16 recites an unclear limitation of "at least four interconnects further comprise four interconnects respectively positioned in each of four quadrants encompassing a periphery of the victim interconnect." In addition, the instant invention does not disclose that at least four interconnects (wires) further comprise four interconnects (wires).

Claim 17 recites an unclear limitation of "the at least four interconnects further comprise eight interconnects substantially surrounding the periphery of the victim interconnect." The instant invention does not disclose that at least four interconnects (wires) further comprise eight interconnects (wires).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 6-8, 11, 14, 16 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Tsai et al. (US Pat. Pub. 2003/0080357), hereinafter Tsai.

Regarding claim 1, Fig. 3B of Tsai shows in a semiconductor package comprising a semiconductor die [32] having a plurality of interconnect pads [in Fig. 3A] positioned thereon and at least one group of interconnect pads, the at least one group of interconnect pads comprising:

a victim interconnect pad [S₁] configured to carry a signal that is susceptible to noise created by surrounding signals; and

shield interconnect pads [GND1, GND2, GND3, GND4] functioning as shields to the victim interconnect pad, at least four of the shield interconnect pads being positioned near the victim interconnect pad and closer to the victim interconnect pad than other noise sources from external to the semiconductor die wherein the at least four of the shield interconnect pads form a noise shield within a periphery of the victim interconnect pad.

Regarding claim 2, Fig. 3B of Tsai shows each of the at least four of the shield interconnect pads is an interconnect for ground.

Regarding claim 3, Fig. 3B of Tsai shows the victim interconnect pad conducts a signal [a strobe signal; a gating pulse signal] that is sensitive to noise.

Regarding claim 4, Fig. 3A of Tsai shows the four interconnect shield pads are respectively positioned in each of four quadrants surrounding the victim interconnect pad.

Regarding claim 6, Fig. 3B of Tsai shows a bond wire [33₁, 33₂, 33₃, 33₄, 33₅] connected to each of the victim interconnect pad and the shield interconnect pads.

Regarding claim 7, it is inherent that each bond wire in Fig. 3B of Tsai that is connected to each of the victim interconnect pad and the shield interconnect pads is routed to a support structure while maintaining a shield structure around the bond wire connected to the victim interconnect pad.

Regarding claim 8, Fig. 3A of Tsai shows the shield structure further comprises a physical arrangement of bond wires electrically connected to the shield interconnect pads to form a cage substantially around the bond wire electrically connected to the victim interconnect pad, the bond wires electrically connected to the shield interconnect pads being closer to the bond wire electrically connected to the victim interconnect pad than other noise sources radiating from bond wires [for neighboring signals CLK, D₁] of the semiconductor package.

Regarding claim 11, Fig. 3A of Tsai shows a first portion [GND1, S₁, GND4, GND6, GND7, D₁] of the plurality of interconnect pads is positioned to a first side of the one group of interconnect pads along a peripheral edge of the semiconductor die and a second portion [GND2, GND3, GND5, CLK, GND8, GND9] of the plurality of interconnect pads is positioned to a second side of the one group of interconnect pads along the same peripheral edge of the semiconductor die.

Regarding claim 14, Fig. 3B of Tsai shows a semiconductor package comprising:
a support structure [31 in Fig. 3A];

a semiconductor die [32] overlying the support structure;

a plurality of interconnects [33₁ – 33₁₂] electrically connecting the support structure and the semiconductor die; and

at least one shielding group [33₁, 33₂, 33₄, 33₅] of interconnects that electrically shield a predetermined victim interconnect [33₃] from noise sources, the at least one shielding group of interconnects comprising at least four interconnects surrounding a periphery region of the victim interconnect and being positioned closer to the victim interconnect than any of the plurality of interconnects.

Regarding claim 16, insofar as understood, Fig. 3B of Tsai shows at least four interconnects respectively positioned in each of four quadrants encompassing a periphery of the victim interconnect.

Regarding claim 18, Fig. 3A of Tsai shows each interconnect of the at least one shielding group of interconnects further comprise an interconnect pad [GDN1-GND6] located on the semiconductor die and a respective connected bonding wire [33₁, 33₂, 33₄, 33₅, 33₆, 33₇] that forms a portion of a bonding wire cage that exists from the semiconductor die to a predetermined site on the support structure.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai in view of O'Connor et al. (US 6692272), hereinafter O'Connor.

Regarding claim 5, Fig. 3B of Tsai shows the most aspect of the instant invention except "each of the four interconnect shield pads is positioned a predetermined distance from a center of the victim interconnect pad and substantially at each corner of a square centered on the victim interconnect pad." Fig. 1 of O'Connor shows a configuration wherein each of the four interconnect pads by pads [in rows 16 and 20] is positioned a predetermined distance from a center of the pad [in row 18].

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of O'Connor into the device of Tsai in order to have a configuration in which each of the four interconnect shield pads positioned a predetermined distance from a center of the victim interconnect pad and substantially at each corner of a square centered on the victim interconnect pad to reduce the package size.

Claims 9-10, 12-13, 17 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai in view of Lemke et al. (US 6692272), hereinafter Lemke.

Regarding claim 9, Fig. 3B of Tsai shows the most aspect of the instant invention except "the victim interconnect pad further comprises two victim interconnect pads positioned adjacent to each other and surrounded by the shield interconnect pads." Fig. 6 of Lemke shows a configuration wherein two victim interconnects (S4+, S4-; signal carrying interconnects) are

positioned adjacent to each other and surrounded by the shield interconnects (G's; ground interconnects).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Lemke into the device of Tsai in order to have two victim interconnect pads for two victim interconnects positioned adjacent to each other and surrounded by the shield interconnect pads for ground interconnects to reduce impedance.

Regarding claim 10, it is obvious that the two victim interconnect pads conduct a differential signal since two victim interconnects of Lemke are a differential pair.

Regarding claim 12, Fig. 3B of Tsai shows the most aspect of the instant invention except "eight interconnect shield pads that are respectively positioned surrounding the victim interconnect pad." Fig. 6 of Lemke shows a configuration wherein eight shield interconnects [G's] that are respectively positioned surrounding the victim interconnects [S4+, S4-].

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Lemke into the device of Tsai in order to have eight interconnect shield pads for eight shield interconnects that are respectively positioned surrounding the victim interconnect pad to improve the reliability of the device.

Regarding claim 13, Fig. 6 of Lemke shows the eight interconnect shield pads are positioned substantially adjacent to each of four sides of the victim interconnect pad and offset from each of four corners of the victim interconnect pad.

Regarding claim 17, insofar as understood, Fig. 3B of Tsai shows the most aspect of the instant invention except eight interconnect shield pads that are more closely positioned to the victim interconnect pad than to any aggressors. Fig. 6 of Lemke shows a configuration wherein

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eight shield interconnects [G's] are more closely positioned to the victim interconnect pad than to any aggressors [neighboring signals].

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Lemke into the device of Tsai in order to have eight interconnect shield pads for eight shield interconnects positioned closer to the victim interconnect pad for the victim signal than to the pad for the aggressor signal to reduce interference from the neighboring signal.

Regarding claim 19, Fig. 6 of Lemke shows that the victim interconnect further comprises two victim interconnects [S4+, S4-] positioned adjacent to each other and the two victim interconnects are surrounded by each interconnect of the shielding group of interconnects [G's].

Regarding claim 20, Lemke discloses that the two victim interconnects conduct a differential signal [col. 4, lines 26-28].

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai.

Regarding claim 15, Tsai fails to disclose that "the at least four interconnects are positioned such that any closest noise source to the victim interconnect is at least 1.5 times a closest bond pad pitch to the victim interconnect." However, it would have been obvious to one of ordinary skill in the art at the time of the invention to have at least four interconnects positioned such that any closest noise source to the victim interconnect is at least 1.5 times a closest bond pad pitch to the victim interconnect for a compact packaging size since it has been held that discovering an optimum value of a result effective variable involves only routine skill

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in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In addition, Fig. 3A of Tsai shows that a pad for CLK [a closest noise source] is positioned at a distance 5 times further than a pad for [GND3;a shield line].

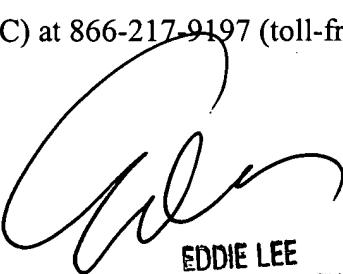
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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